

Hobbies

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A WORKBENCH AND EXTENDING KITCHEN TABLE

THE kitchen table illustrated here is a really useful item of equipment. The two drawers are of fair size and can be used for holding cutlery and the small accessories needed in the kitchen, while the open cupboard beneath them provides ample storage space for pots

and pans. In addition, the table top can be increased in size by means of two extra leaves which are supported on simple swinging frameworks.

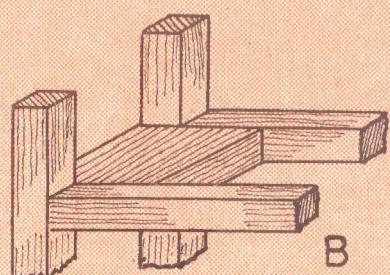
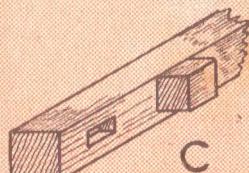
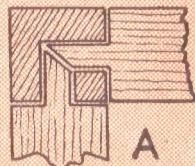
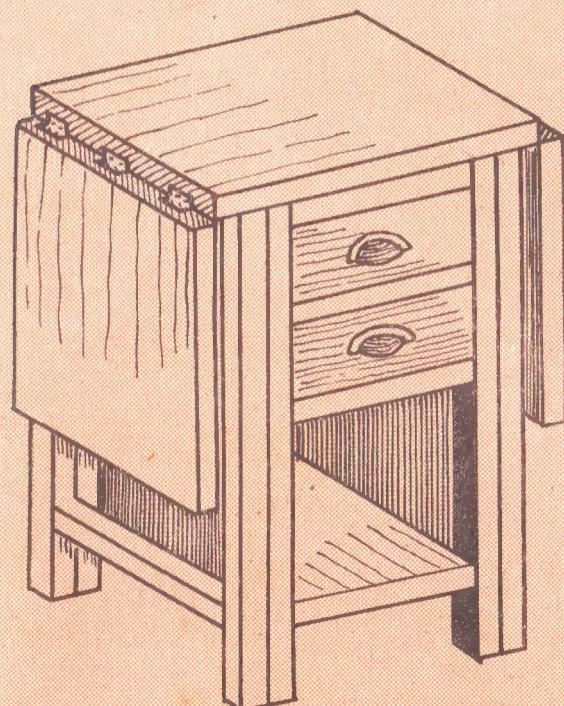
The four legs of the main framework measure 2ft. 6ins. high and 1½ins. square. Two slots and four mortises are cut on two adjacent faces of each leg, all slots and mortises being 1½ins. long and ½in. wide, being set in the centre of the leg.

The bottom edges of the slots are at 1½ins. from the top of the legs, while the mortises have their lower edges at 7ins. and 1ft. 6ins. from the top of the legs; all slots and mortises are worked to a depth of 1in. so they meet in the thickness of the wood.

Before the rails can be prepared an additional mortise must be cut on each leg. This is to take one end of the bottom side rail which supports the lower shelf, and must be cut on the appropriate face of each leg. As before, the mortise is 1½ins. long, ½in. wide and 1in. deep, and has its bottom end at 4ins. from the bottom of the leg.

Back and front rails are all 1ft. 2ins. long and 1½ins. square. Six such rails will be needed, and each has a 1in. long by ½in. wide tenon saw cut from each end. The extreme end of each tenon should be sawn across at a mitre angle so that the rails can meet correctly in the thickness of the leg (see drawing A), and two slots should be cut on the inside face of the top back and top front rails. These slots are 1in. long, ½in. wide and ½in. deep (having their top edge at ½in. from the top of the rail) and are spaced out at equal distances apart between the shoulders of the rail.

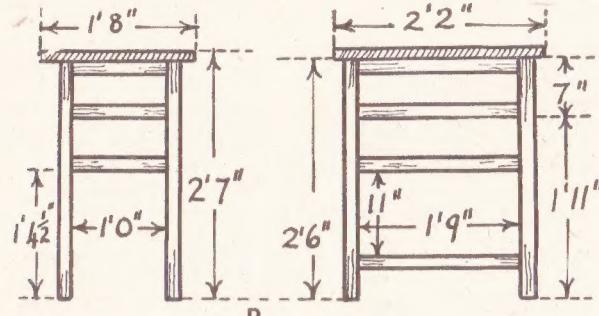
The back and front frameworks can then be glued and cramped up, being left under pressure from



the cramp until the glue has set hard.

The top and bottom side rails are 1ft. 11ins. long, $1\frac{1}{2}$ ins. wide and $1\frac{1}{2}$ ins. thick. They are prepared with a tenon at each end so that they fit flush with the inside faces of the legs, while the top rail has three slots (similar to those on the back and front rails) cut on its inside face.

The two remaining rails on each side



are 1ft. 11ins. long, $1\frac{1}{2}$ ins. thick and $3\frac{1}{2}$ ins. wide. These have a tenon 1in. long and $\frac{1}{2}$ in. wide sawn out of each end, so that when assembled into the framework, the outer edges of these rails will be flush with the outer edges of the top and bottom rails, while the inside edges of them project inside the carcase to form drawer runners. Drawing (B) shows how these rails project inside the framework.

When these side rails have been completed the main carcase can be glued and cramped together.

Plywood or hardboard can be used as desired for filling in the back and sides. For the sides a 1ft. 9ins. wide strip fitting level with the top of the top rail

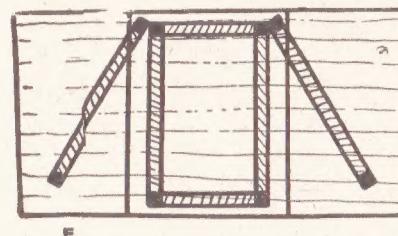
and the bottom of the bottom rail will be needed, while at the back the plywood fits flush with the outer edges of the legs.

Securing the Top

To secure the table top ten 'thumb-pieces' will be needed. All thumb-pieces are 1in. long and deep by $1\frac{1}{2}$ ins. wide, with a rebate $\frac{1}{2}$ in. wide by $\frac{1}{2}$ in. deep cut from the top edge. Each thumb-piece

Wood $1\frac{1}{2}$ ins. square is used throughout for the two swinging frameworks. Each framework has four members, two legs 2ft. 6ins. high and two rails 1ft. 11ins. long which are sunk into 1in. deep mortises on the legs; the position of these rails correspond to those of the top and bottom rails on the main carcase.

When completed, the frameworks are hinged to the back legs of the main carcase so that they can swing outwards. The extension leaves (each 1ft. 3ins. long, 2ft. 2ins. wide and 1in. thick) are then hinged to the ends of the fixed top. Drawing (E) gives a plan of the assembled table showing the frames swung open to support the extra leaves.



can then be glued into a slot so that its top edge is flush with the top of the rail (drawing C).

The actual table top measures 1ft. 8ins. long by 2ft. 2ins. wide and 1in. thick, boards being glue-jointed along the edges as necessary to get the required width. This table top is placed centrally over the main framework and is held in position by screws that pass up through the thumb-pieces.

The bottom shelf is the next item to be fixed, and is simply cut to size and screwed down on top of the bottom rails; a ratchet brace and screwdriver bit will be found very useful for fixing this. Drawing (D) shows the main dimensions of the carcase at this stage.

When making the two drawers a suitable panel should be sawn and planed to make a good fit to the drawer opening. This is then used as the drawer front, the drawer itself being assembled with ordinary butt joints. To prevent end-grain showing on the front of the drawers the front edge of the drawer sides can be fitted into rebates cut on the inside of the drawer front. Glue and nails can be used for assembling the drawers, all nails being punched well home and made good with plastic wood. A brass handle can be fitted to the front of each drawer.

After a thorough glasspapering the legs and framework can be stained or painted, but the table top and leaves should be left untreated. (346)

Some odd pieces of material can make an ARTISTIC CANDLE HOLDER

A PAIR of artistic candle holders make a very acceptable present, and the design illustrated by Fig. 1, is well worth making. The holders

gives one an opportunity of using up some of the smaller pieces of wood which may be lying around. The method of making the holders is described in the following manner.

The base is made in two parts and this is indicated in view (A) Fig. 2. From good sound pieces of wood $\frac{1}{2}$ in. thick cut the base $3\frac{1}{2}$ ins. square, as indicated. The top part of the base which holds the candle is made in wood $\frac{1}{2}$ in. thick, and cut this 2ins. square, as indicated. In the middle of this piece, carefully bore a hole 1in. in diameter. When these parts have been made and well smoothed up, fix the 2in. top part in the middle of the base with glue.

Details of the acorn sides, four of which are required for each holder, are indicated in view (B) Fig. 2. Divide pieces of $\frac{1}{2}$ in. sound wood 2ins. square into $\frac{1}{2}$ in. squares, as indicated, and then draw the outline of the acorn from the illustration. Carefully cut the acorns out with the fret-

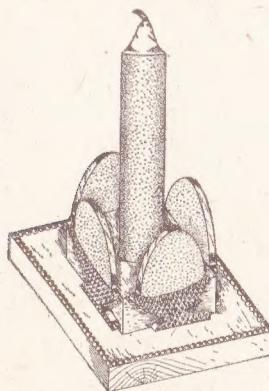


Fig. 1—Completed holder

saw, and smooth up the surface, taking particular care with the edges.

The acorns when made are carefully fixed in position with glue on the sides of the top portion of the base, as clearly seen in Fig. 1. Strips of $\frac{1}{16}$ in. half-round beading are glued on the edges of the base, as shown, which adds to the artistic nature of the object.

The article is nicely finished off by staining the base, with the top portion holding the candle coloured with white or cream enamel, and the acorns coloured with green enamel. Use light green for the acorn and two shades of darker green for the acorn cup. (348)

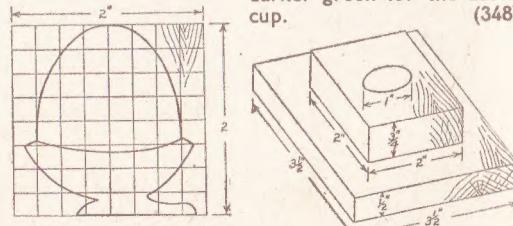
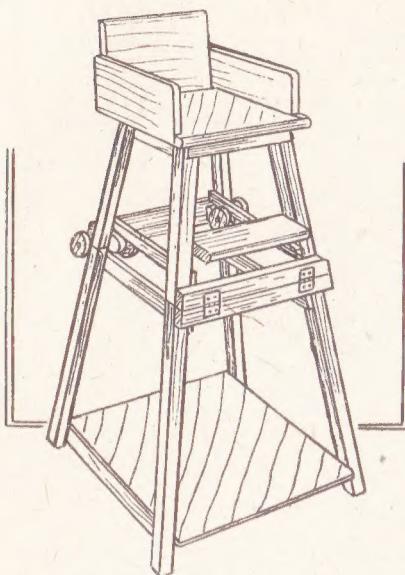


Fig. 2—Details of base and acorn sides

look quite attractive if the acorns are nicely coloured. The design is simple and lends itself to quick production, and

Any little lady would be delighted with this convertible DOLL'S TALL CHAIR



THIS little model would make a delightful present for a child. It is a reduced size chair of the popular convertible type, the lower portion swinging upwards to form a play table for the baby. Its dimensions are about right for the average size doll.

A front and side view are given in Fig. 1, with such dimensions as are necessary. The lengths of most parts are given in the cutting list, and need not be repeated here. Having cut the four legs, cut the top and bottom horizontal bars.

Glue and nail these bars across the legs, as in the side view. This will make the necessary splay for the chair's stability. Then saw off the ends of the bars to the slope of the legs. Note here that these bars are to be fixed on what will be the inside face of the legs.

The middle bars are then fitted across at the distances shown. The lengths of these, given in the cutting list, are approximate, and should be measured across the legs for exactitude. Trim off any projections level with the outer slope. These pairs of legs are now to be joined together to complete the stand,

and a careful survey should first be taken of the front view in the diagrams.

The top and bottom bars are fitted similarly to the side ones, but note that the lower bar, seen in the drawing, goes across the rear of the stand only, no front one being required. Cut the play table from plywood, and nail and glue to the side and bottom rear rails. Here again, it being impossible to supply really exact sizes, actual measurements across and along the bars should be taken beforehand.

The table should extend beyond the front legs by $\frac{1}{2}$ in. and be level with the side and rear bars to which it is to be nailed. The table will keep the front legs at their correct distance apart, but it is a helpful plan to nail a temporary bar across before fitting the play table, to better ensure the front legs splaying equal to those at the rear.

The bar can be removed directly the table is fixed, and if the nails used to keep it in position are driven into the ends of the side bars, instead of into the legs, the holes will be inconspicuous afterwards.

Glue and nail the front middle bar across, then the rear one. The latter, it will be noticed, is double the thickness of the front one, and longer, so that it extends a little over the sides, as shown by the dotted lines. The legs should now be trimmed at their bottom ends to bed flat to the floor.

Run a pencil line across the centre of both front and rear middle bars, and extend these lines across the sides of the legs as well. With a tenon saw, divide both bars and saw across the legs to divide the stand into two portions. The sawn edges here should be well glasspapered.

Remove the upper half of the stand, and to the rear legs of it, at the bottom, fix a pair of wood supports, shown at (A) in Fig. 2, to which the rear wheels can be fitted. These supports are cut 1 in. wide and $\frac{1}{2}$ in. thick, trimmed at their rear ends to the slope of the bar (rear middle one) and planed on their inside faces to a 10 degree bevel, as seen in the diagram.

Round the front ends of these supports, and at $\frac{1}{2}$ in. from here, bore a small

hole with a bradawl for the screws, which will fix the wheels in position. Fasten each support with glue and a single screw to its respective leg, and drive a couple of nails through the rear bar into them as well.

A sound secure fixing should result, with the inside faces of the supports truly vertical, instead of sloping. The extended ends of the rear bar can now be sawn off. The other half of this bar, now attached to the lower half of the stand, should be left with its ends extended, as fixed, and to the ends of it, the front pair of wheels will be fitted later.

Hinge the two parts of the stand together with a pair of 1 in. butt hinges screwed to the front middle bar. Turn

CUTTING LIST

Legs (4)	—1 ft. 6 ins. by $\frac{1}{2}$ in. by $\frac{3}{4}$ in.
Top bars (4)	—6 $\frac{1}{2}$ ins. by 1 in. by $\frac{3}{4}$ in.
Bottom bars (3)	—1 $\frac{1}{2}$ ins. by 1 in. by $\frac{3}{4}$ in.
*Front middle bar	—8 $\frac{1}{2}$ ins. by 2 ins. by $\frac{3}{4}$ in.
*Side middle bars (4)	—8 $\frac{1}{2}$ ins. by 1 in. by $\frac{3}{4}$ in.
*Rear middle bar	—9 $\frac{1}{2}$ ins. by 2 ins. by $\frac{3}{4}$ in.
*Play table	—12 $\frac{1}{2}$ ins. by 9 $\frac{1}{2}$ ins. by $\frac{3}{4}$ in.
Chair seat	—7 ins. by 8 ins. by $\frac{3}{4}$ in.
Chair sides (2)	—7 ins. by 4 $\frac{1}{2}$ ins. by $\frac{3}{4}$ in.
Chair back	—7 $\frac{1}{2}$ ins. by 6 ins. by $\frac{3}{4}$ in.
*Approximate lengths only. Footboard and wheel supports from scrap wood.	

FITTINGS

I pair 1 in. butt hinges, 1 hook fastener, and 4 wheels (wood, 2 ins.).

round, and hold the rear middle bars together with a hook fastener, going under a screw head, as in detail sketch (B). A footboard of $\frac{1}{2}$ in. by 2 in. wood can be nailed across the legs at the front, at any convenient distance down from the top, somewhere about where shown in Fig. 1. A good glasspapering all over will be necessary now to remove roughness.

The seat, Fig. 3 (plan and side view) can be made from $\frac{1}{2}$ in. wood to the dimensions given. Round the front edge. Cut away the side edges of the seat from $\frac{1}{2}$ in. at the front to the back for the sides to sit in. Cut these to the length given in the cutting list and trim the rear ends to a slope, the bottom length of the sides being then $6\frac{1}{2}$ ins. Nail these in place, then cut and fit the back rest in.

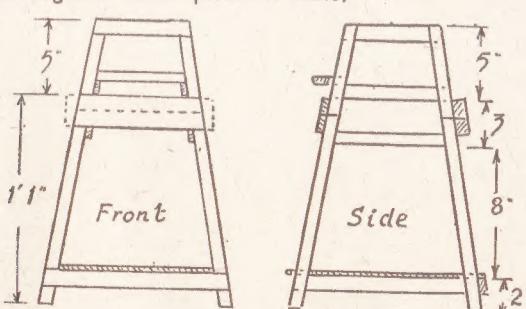
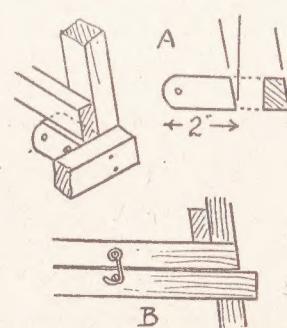


Fig. 1—Front and side view



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Fig. 2—Joints and fixing

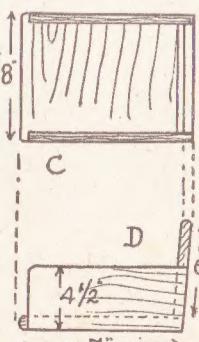
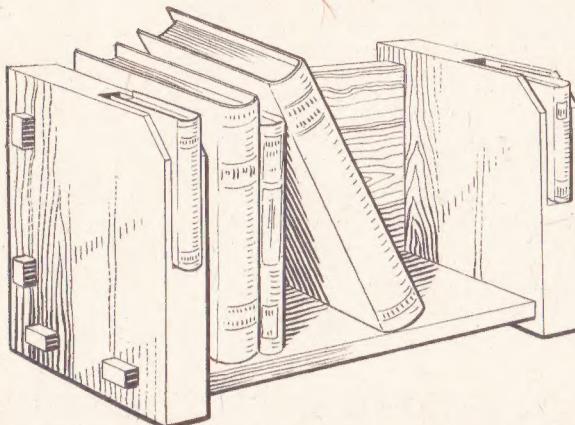


Fig. 3—The seat

Notice the small books standing in the ends of this NOVEL BOOKSTAND



EVERYBODY who uses a number of books needs some method of keeping the few that are in current use tidy. These few books are almost certain to include a dictionary and a ready-reckoner. There are on the market today, some very convenient and reliable pocket dictionaries and ready-reckoners. As they are of pocket size they are often mislaid under other books.

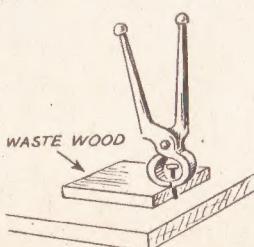
The bookstand shown here makes special provision for these small, but invaluable, volumes in its ends. It is quite easy to make and when finished it will look attractive and be useful on any desk or side table at home.

Materials

The dimensions of the pieces of wood required can be seen on the diagrams. Oak is the most satisfactory wood to use, but there is no reason why any wood free from too many knots should not be used. The outsides of the ends may present some difficulty as they are only $\frac{1}{8}$ in. thick. Plywood could be used but it would tend to make the stand look cheap.

Prevents Damage

A PIECE of waste wood placed beneath the pincers when withdrawing a nail, prevents the wood from getting bruised and marked, as shown in the illustration.



finish. A pleasant serviceable surface can be made by staining the wood and then polishing it with white furniture polish. Light and dark oak stains are the best for general use.

Construction

The centres of the two ends should be cut out first. Ensure they are both the same size and that the edges are square. They should be $\frac{1}{8}$ in. thicker than the pocket-books; $\frac{1}{8}$ in. is usually suitable. Using a strong glue, stick a strip of felt along the two edges of the cut-out portion.

Next cut out the outsides of the ends from the thin wood. Cut them in pairs so they match perfectly and give the outer edges a slight chamfer with glasspaper. Stain inside the top front corner of each piece now, as this will be difficult when it is assembled.

The ends must now be stuck together like a sandwich with thin layers of strong wood glue. The thick centre piece is between the two thinner pieces so the rebate cut in it makes the little recess for the book. The back and bottom of this recess have already been lined with felt. Clamp the two ends and put them aside to dry under pressure.

Now cut the back and bottom of the stand from $\frac{1}{2}$ in. wood. Use the exact measurements shown in the diagrams, being particularly careful with the tenons. Glasspaper them smooth and then put a chamfer on all four edges of the end of each tenon and the top of the back and the front of the bottom. Drill a hole $\frac{1}{8}$ in. diameter $\frac{1}{8}$ in. from the end of each tenon in a central position. These holes will be for the pegs that hold the tenons.

The positions for the mortises on the ends should be marked in pencil. Each hole will be $\frac{1}{8}$ in. by $\frac{1}{8}$ in. To make the job

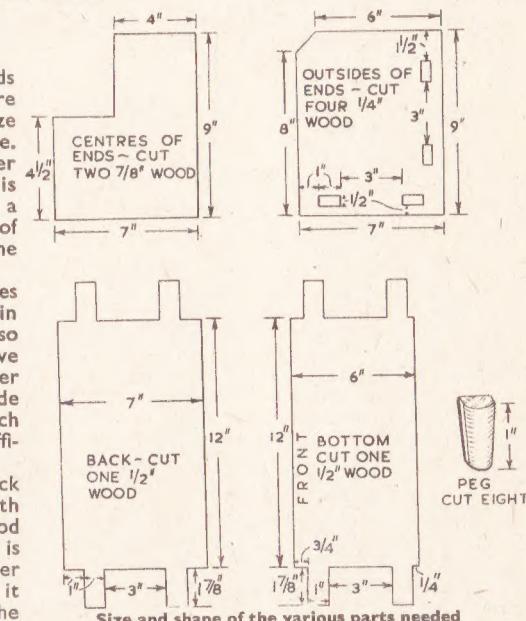
easier, drill two $\frac{1}{8}$ in. diameter holes inside the pencil lines and clean the mortises out with a chisel. The bookstand can now be assembled to make sure that the joints fit well.

Eight small pegs will be required. These should be cut out as shown in the diagram, bearing in mind that they have to fill a semi-circular hole $\frac{1}{8}$ in. wide.

Assembling the Bookstand

It will be very much easier to stain the stand before it is assembled than afterwards. After staining, leave the parts to dry thoroughly and then fit them together again to check that the joints are tight and that the bookstand is level and does not wobble.

Before assembling finally, a little glue may be put round the bases of the tenons and on the ends of the back and bottom between the tenons. Ensure this does not run out of the joints on to the wood.



Size and shape of the various parts needed

Put a smear of glue on the backs of the pegs and inside the holes and then press them home by hand.

Use a piece of scrap wood as a punch and tap the tops of the pegs gently with a hammer until they are quite firm. Allow them to dry before handling the stand. Cover the bottoms of the ends with felt and trim it neatly. Finally polish the whole job with white furniture polish.

This bookstand complete with a pocket-dictionary and ready-reckoner, which cost two shillings and sixpence each, will make an ideal Christmas present for anyone who reads and writes much.

The housewife will be delighted with these KITCHEN FITMENTS

NOW there is an ample supply of beadings and hardboard the handyman can amuse himself by making all sorts of kitchen fitments to augment or improve the existing ones. A little planning on modern lines will enable him to make a very super kitchen at nominal expense.

If replanning altogether then study the sketch at Fig. 1, which gives you some measurements at which to work. Design the cupboards so that the broom and feet have a clearance as shown. Note the best height at which to work which is 3ft. The 3in. deep well rounded board at the back saves bits of food and other materials from going down behind. This is often the cause of an offensive smell in the kitchen.

In the upper part of the sketch is shown a unit which, by its design gives you much better space for goods in continual service, cups and saucers at the bottom, tea plates and bowls centre and larger plates at the top. Here again (at Fig. 2) note the height at which to carry it. Space above this is awkward and might be filled in as a cupboard to hold larger dishes and items not so often in use. Obviously, to get them out you need a small step ladder or chair and, therefore, this rules out the question of general storage.

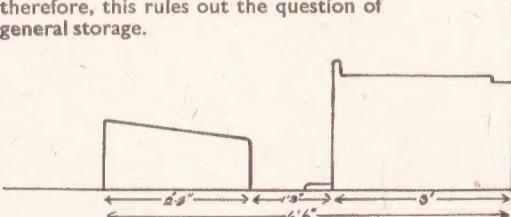


Fig. 1—Suitable spacing

In planning the kitchen fitments consider the position of the window, door and also if you have a serving hatch. Work all fittings in to give every comfort in working.

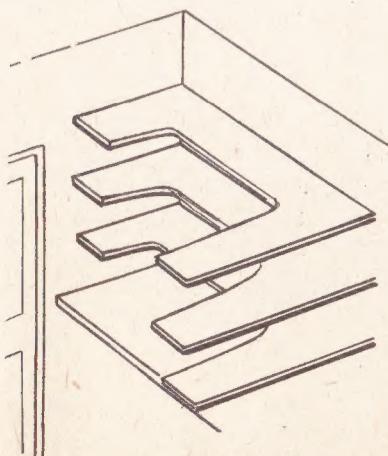


Fig. 3—Shaped shelving

Nearly all housewives have a complaint about their food cupboard. At the best of times and in many houses it is small and the shelves unsuitable. Provided the shape is right the shelves suggested here at Fig. 3 should solve many of the storage problems.

As you will see the shelves are specially designed to use up all the available space all round and not overhang and blot out the light. One can also get to them quite easily. These should be made in hardboard and the battens along the wall should be carried right along the side and the two ends. This will allow ample support for the shelf sections.

If in doubt about the stress and strain then screw in 1in. square battens along the edges at the front. Heavy and tall jars and items should be kept at the back and the smaller ones in the front. This will prevent them being hidden up as they are on the older type of shelf.

In designing the working table for the kitchen it is a good idea to provide a space for the spare tea trays, as these are

often left about and damaged. As shown at Fig. 4 the table is extended over the outer and upright panel and a step with an upright is then fitted along. Three ½in. dowel rods can then be set in the top and extended to the base.

In older types of kitchens we often have an awkward shaped corner, perhaps, where the copper once stood and has now been removed. This space will make an ideal small dresser for cups, saucers and plates.

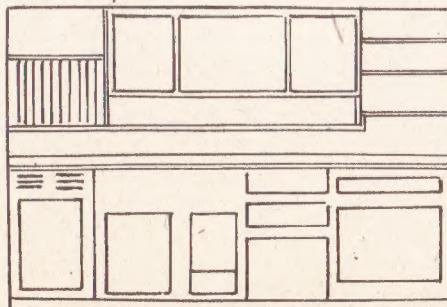


Fig. 6—A one-wall unit

As shown in the sketch at Fig. 5 it can have four shelves and these can be made from floor board screwed together with 1in. quartering underneath. Battens of 2in. deep wood by 1in. wide should be fitted to the wall first. A deep edging about 3ins. will help to finish it off and will take off the unsightly projection of the wall.

If you are able to cater for the housewife by rebuilding the whole of the fitments on one wall you can do this by a planned unit as shown (see Fig. 6). Here you have the most compact and complete set of fitments it is possible to get in a space of, say, 6ft. high by 6ft. long. It can be built in hardboard with the drawers in light white wood.

Note that provision is made for practically everything. The writer has seen this fitting made by a home handyman who has himself been amazed at the space he was able to save. The addition of the garbage section is an asset and this should be lined with zinc or tin for the sake of cleanliness.

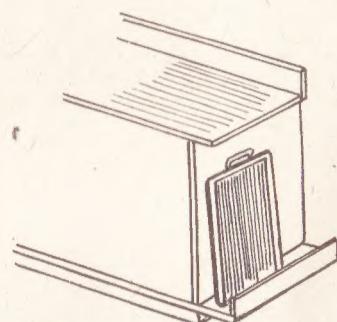


Fig. 4—A tray holder

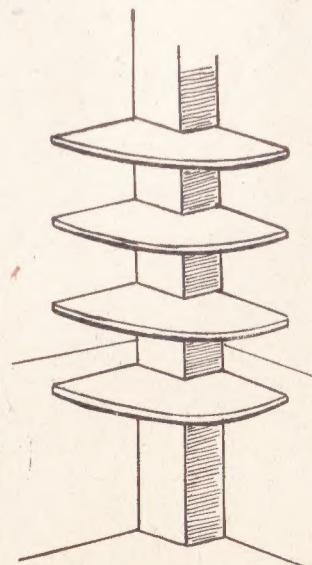
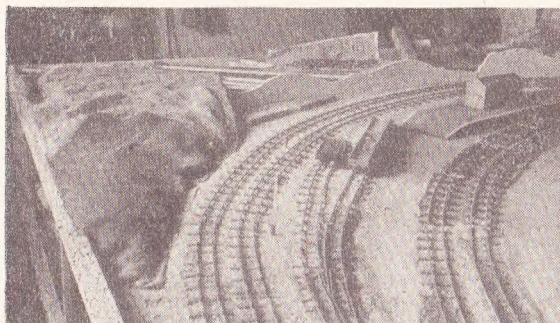


Fig. 5—Corner benefits

Elements of scenic effects in attractive MODEL RAILWAY WORK



Hill scenery in course of construction with sacking and wood

No matter how perfect a model railway may be from a purely 'railway' angle, it can always be made more interesting and imposing—particularly to the casually interested onlooker, by the judicious addition of scenery and architectural features.

The making of 'hills' and 'valleys', embankments and cuttings, as well as trees and hedgerows is not by any means such a difficult task as might be imagined, being well within the capability of the average model railway enthusiast. Moreover, the materials needed are neither scarce nor costly, and the tools used are of the very simplest character.

Framework

The basis of all scenic modelling is the construction of a very rough wooden framework from laths or scrapwood to the very approximate contours of the 'ground' being modelled, but as it is extremely difficult to cut down into the

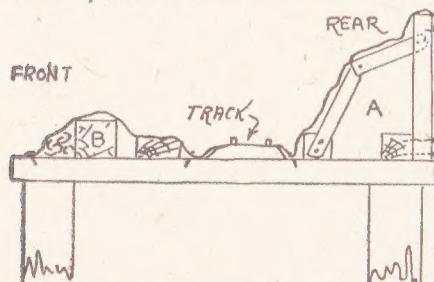


Fig. 1—Cross section of single track layout

railway baseboard to produce actual valleys with embankments crossing them, this effect has to be produced by the illusion created by the building up of the 'hills' at the front and rear of the railway tracks.

Cuttings

In Fig. 1 is shown the cross section through a single-track line running in a cutting. It will be seen that by building a rough framework at (A), and the laying of long pieces of 2ins. by 1in., and 2ins. by 2ins. (seen in end section), and after-

wards covering these with paper (treated as will be described), the track immediately appears as though it were in a deep cutting. This illusion is largely created by the steep cutting wall at the rear of the rails.

Similarly, in Fig. 2, the effect of an embankment can be produced by slightly raising the track and building skeletons as shown, arranging a gently-sloping 'hill' to gently merge into the back-cloth scenery, thus completing the illusion of distance.

Canals and Boats

The inclusion of a canal or river where shown, with barges or boats, will break an ugly gap which can exist very easily between the near and middle-distance.

The angle of the upswept rear 'hill' should not be made greater than about 30 degrees with the horizontal, otherwise the 'hill' will refuse to blend smoothly into the painted vertical back-cloth. By using the angle shown—or less, according to the width of the railway baseboard, the eye, when viewing the scene in its entirety from the point (X), will readily accept the tilted back portion of the layout as if it were flat.

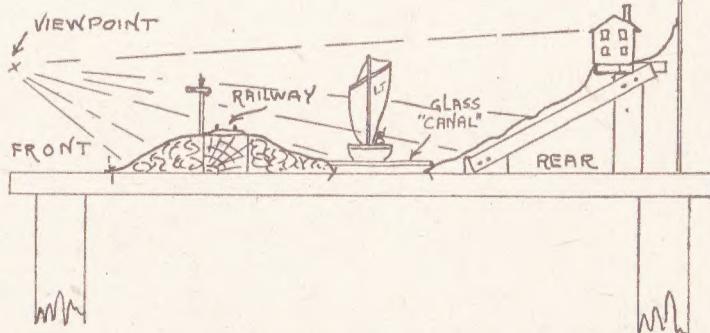


Fig. 2—Embankment effect with 'canal'—all shown in cross section

This illusion will be increased by the fact that the rear edge of the embankment (Y) will cut across the river and barges, and thus give a very pronounced stereoscopic effect which will throw the railway track and river traffic into strong perspective and relief. This is just the effect we want.

Making 'Hills'

The covering material most generally used in professional circles is that generally known as papier-mâché, which is quickly and most cheaply produced in

the following manner:—

The Mixture

Obtain a large saucepan, and tear up into it old newspapers or any other paper not of the 'shiny' variety, until it is three-quarters filled. Then add hot water until the pan is half-full of a mush of paper and water, and boil gently for about four hours, at the end of which time the paper will be found to have disappeared, it being replaced with a mass resembling porridge. If all signs of paper have not disappeared, continue to boil until all is reduced to a perfect pulp.

The pan should now be removed from the fire and ordinary glue or flour paste added in the proportion of one part glue or paste to one part of paper pulp, stirring well during the mixing. Size will do instead of weak glue or paste.

When all is well mixed, add sufficient plaster of Paris to make a good 'stodgy' paste of the whole mass, of about the consistency of mortar.

Application

This mixture should be immediately applied to the brown paper-covered wooden frameworks, and must not be worked dry, otherwise it will not adhere to the woodwork. If any difficulty is experienced in this direction, the offending part of the framework should be well moistened with some of the liquor from the saucepan before applying the papier-mâché.

Another Method

Another good method of modelling is that of dipping sheets of brown paper into a strong solution of size, and dropping them, whilst wet, over the wooden framework already made. Whilst the sheets are wet they may be moulded into any desired contour, but when thoroughly dry they may be painted to represent earth, grass or rocks, as will be explained in the next article in this series.

(To be Continued)

Better reproduction is obtained by the correct AERIAL INSTALLATIONS

A RADIO receiver can only reproduce the signals picked up by its aerial. In other words—a receiver is as good as its aerial. Years ago this was appreciated and high outdoor aerials were usual; today, receivers are so much more sensitive almost any odd length of wire will function and the user often fails to realise how results are being spoiled.

With a poor aerial distant stations will be almost inaudible; the signal

take it in one unbroken length from the insulator remote from the house right to the lead-in tube or receiver. Two china egg insulators are used at each end, as shown, and the aerial passes through one near the house so that the down lead is an unbroken section of the aerial itself.

Where the aerial passes through the insulators it should be tied or bound with thin wire. Cord or wire may be used between the adjacent insulators, wire being more lasting. Further lengths

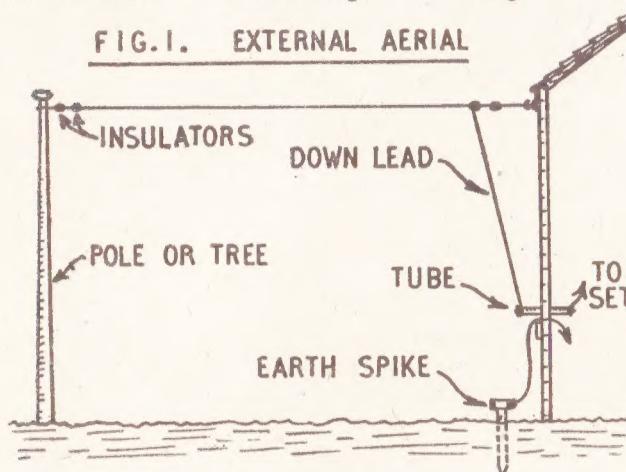
of cord or wire support the whole from pole to house.

A Chimney Aerial

Where there is little or no garden space but the best aerial permissible in the circumstances is required, the form shown in Fig. 2 can be used. Such aerial rods may be purchased or devised from materials to hand. The rod is secured in an insulated fixture, a metal bracket being provided for mounting. A further bracket with an insulated lead-through fitting is used to keep the down lead well away from the roof and wall.

As with Fig. 1, the down lead should be

FIG. 1. EXTERNAL AERIAL



pick-up from nearer stations will also be reduced. As a result the receiver volume control will have to be turned more towards maximum setting, which will cause an increase in background noises.

Up to date receivers with A.V.C. (automatic volume control) require a reasonably strong signal. Without it the A.V.C. cannot function properly and the programme will 'fade' or fluctuate in strength. In other cases, the use of an efficient aerial may make all the difference in bringing various desired stations up to good strength, or in enabling them to over-ride crackling and other background noises.

Outdoor Aerials

Though efficient indoor aerials can be used an outdoor wire well clear of surrounding buildings and as high as practicable provides the best signal pick-up. A typical aerial of this type is illustrated in Fig. 1 and it is usually possible to erect it somewhere between the house and a convenient tree or pole. The length of the horizontal portion depends largely on surroundings, but something between about 30ft. to 50ft. is average. Even a much shorter length will give excellent results.

Proper aerial wire is best. This is usually copper, and referred to as 7/32 S.W.G. (which means there are seven strands of 32 S.W.G. wire). It may be bare or covered and it is best to

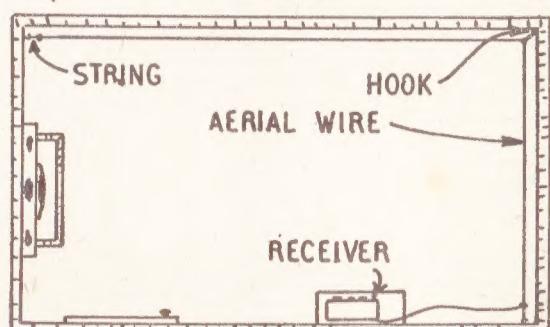


FIG. 4. AN INDOOR AERIAL

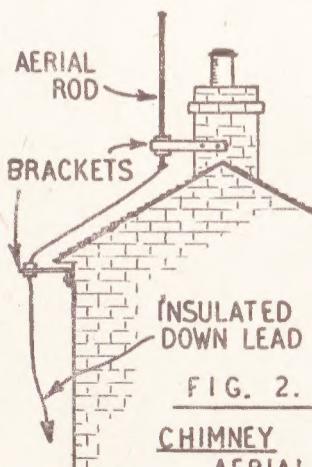
at least 1ft. away from the building, if possible, for most of its length. Actually, this lead contributes materially to the strength of the signal pick-up, but if it is poorly insulated or near brickwork and other earthed objects it will not be able to function in this way. Instead, actual loss of volume may be caused.

Lead-In and Earth

Proper insulated lead-in tubes are obtainable to bring the aerial lead into the house. Alternatively, if a small hole (say, $\frac{1}{2}$ in. diameter) can be drilled through a wooden part of the window-casement the down lead may be carried through this and right to the receiver.

Insulating tape or a short length of rubber tubing can be added to prevent rain running down the outside wire into the hole. Or the down lead may be passed between window and casement. Usually this will not prevent the window being closed and results will be satisfactory if rubber-covered wire is used.

For the earth lead bare copper wire can be used. It should go to a metal object in the earth itself outside the house. A damp spot is preferable and a piece of bare wire netting or other metal object buried in the ground can be used if a proper copper tube or spike is not available. Good contact is desirable between 'earth' and lead, soldering



**FIG. 2.
CHIMNEY
AERIAL.**

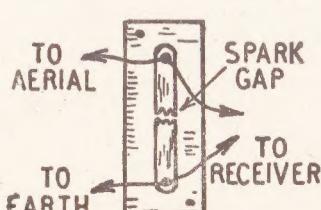


FIG. 3. LIGHTNING ARRESTER.

Make your garden gay by introducing and COLOURING A PATH

IT is pretty safe to say that most modern handymen can use cement, either plain or worked up into a concrete of one sort or another. Indeed, it has amazed the writer to note the really big number of people who now-a-days use it freely about their homes, making steps, paths, shed floors, grass edging and the like.

Most workers seem to use the ubiquitous plaster in its original grey form, so we get everywhere grey steps, grey paths and grey floors. There is really no need for the monotony, however, for cements and concretes can be coloured to almost any tint desired.

Seaside resorts have been making a great effort recently to get away from the continuous grey and at some places whole areas of promenade and paths over which holiday-makers surge are laid in pleasant eye-resting greens.

For the Amateur

Now there is not the least reason why the amateur path, step and floor layer should not follow suit and have his paths, steps and floors to some definite colour scheme, for colouring concretes and cements is particularly easy.

As but the surface of the items are seen, only the top layers to a depth of about 1in. need be coloured, the under layers being in the usual 'concrete grey'.

Colouring is effected by the adding of pigments, and these are mixed in with the cement (Portland) while it is dry. The intermingling must be particularly thorough, or streaky and patchy results may come about.

To ensure this perfect intermixing, the cement in the first case should be of a finely ground kind and secondly be sieved through a fine mesh to get rid of any tiny lumps that may have crept in. The pigment, too (which is bought in powder form), must be perfectly clear of

'bits'. Complete fusion is brought about best by mixing in a fairly deep container with a dry stick, the stirring being vigorous.

Pigments

Now as to the pigments to give various colours and the proportions to be used. Red is a very good colour for steps and is produced by adding 2lbs. of red oxide to a bucketful of cement. A green is secured by adding 10 parts of oxide of chromium to every 90 parts of Portland cement, while a nice blue comes by putting 14 parts of ultramarine pigment into 86 parts of cement.

A chocolate brown is only secured by mixing several colours. These are black oxide of manganese (6 parts), red oxide of iron (4 parts) and black oxide of iron (2 parts), all being added to 88 parts of the cement. Yellow as a finish is given by the simple addition of yellow ochre in the proportion of 12 parts to 88 parts.

Black paving finishes are seldom required unless for an edging or marking out of, say, a games court, but they can be obtained by mixing 10 parts of 'carbon black' or black oxide with 90 parts of cement.

Waterproofing

In all cases it is good to add a waterproofing ingredient to the cement and pigment, 3 parts of such an ingredient going to 100 parts of the mixture already secured. This waterproofing gives a stronger and better weather-resisting top surface.

As stated, the top layer only of any item need be coloured, the lower parts being just the usual mixtures. Thus, suppose one wished to lay a green path, the first thing would be to make a base concrete of 1 part cement, 2 parts sand and 4 parts of broken stone, taken down to lumps not bigger than 1in. across. These components are all churned up

dry and water then slowly added till a workable paste is secured.

The 'bed' of the path must have been prepared first, of course, and then the concrete just made is laid on it to such a thickness that its upper surface is about 1in. below the final desired level. Tamp the mixture well down and strike a rough top level with a board used on edge.

Basework

This base must set well before putting on the top layer and twenty-four hours at least should elapse before continuing with the work. When all is ready, however, mix the coloured top dressing. This can basically be cement and sand, or for a path, cement, sand and very fine granite chippings. The final proportions work out to:

2½ parts of sand, or sand and chippings

1 part of Portland cement mixed with the green pigment and waterproofing ingredient.

Again mix dry and then slowly add water till a good workable consistency is obtained and apply this to the mixture already down, smoothing off the top carefully and cambering slightly if desired to give good drainage. Now leave everything to dry out and if all has gone well a path of a pure even green should result.

Colour Schemes

With regard to the colour scheme to adopt, much depends on the conditions and effect it is wished to secure. Red is a colour often adopted for single steps, but can be a bit fierce if used over a large area. Much better then for any expanse is a green or chocolate brown. Yellow is good for a floor inside a shed, as it gives lightness and a general sunny effect. As suggested, blacks should only be used for borders and other special positions where an 'outline' effect is desired. (342)

Aerial Installations—(Continued from page 311)

being best. As with the aerial, loose joints should be avoided because they may cause crackling.

Lightning Protection

Though there is little chance that lightning will strike an outdoor aerial, an arrester may be added as shown in Fig. 3. Here, there is a small gap between metal strips fixed to an insulated base, so that if lightning strikes the aerial, it jumps the gap and runs harmlessly to earth.

Aerials do not attract lightning; actually, an aerial such as that in Fig. 2, if fitted with an efficient arrester, will protect the house.

A similar result to that provided by

the arrester may be obtained by connecting the aerial to the earth lead when tempest is about. Switches for this purpose can readily be obtained.

Indoor Aerials

Where an external aerial cannot be erected, or is considered undesirable, an efficient indoor arrangement is still possible. Fig. 4, which gives a plan view of a room, shows how such an aerial can be fitted.

For best results, the wire should be a few inches from the walls and thin string can be used for insulating the ends. Thin insulated wire in various colours can be obtained cheaply from the well-known popular stores and this is

quite inconspicuous. The aerial should be as long as possible, but normally it is unwise to take it round more than two walls of the room or the closed loop formed will have curious directive properties. Arrange the wire fairly near the ceiling.

If there is a picture rail well insulated wire can be placed round in this, completely out of sight. If possible, keep the wire away from those sides of the room where mains wiring or other metal fitments are situated.

Finally, it is suggested that the present is the best time at which the listener can check over—and, perhaps, improve on the lines mentioned—his important (but often neglected) aerial system. (351)

A novelty for the home is this simple KNITTING COMPANION

THE ball of wool that will keep rolling about is always a problem to the knitter. Besides the risk of getting dirty by rolling about on the floor there is the further danger of the ball getting very tangled up. There have been many gadgets on the market for holding a ball of wool so as to make the job of knitting easier.

The novel delivery box described here is an excellent example of such an article. It is a really attractive addition to the worktable, as well as being very efficient in its working. As will be seen

shape shown, leaving a flat piece for fastening to the side of the case.

Do not make the beak too pointed as a medium size hole must be drilled through for the wool to slide in easily. About $\frac{1}{8}$ in. should be ample for the hole, which is drilled right through the head and near the top of one of the sides of the case.

Shaped Head

The head is nicely glasspapered and also the hole through it must be made very smooth, as the wool is liable to catch on the slightest roughness. The

them. This is to prevent the ball of wool from falling through when it is nearly used up and is very small. Quite thin plywood can be used and the two side pieces are best cut and glued in position before the two halves of the case are glued together. Leave a gap of about $\frac{1}{8}$ in. between the rollers and the false bottom.

Now glue the two halves together, making sure that the rollers run easily and do not bind anywhere, nor should there be too much play here. When nicely dry and set hard, the false bottom between the rollers is cut and fixed.

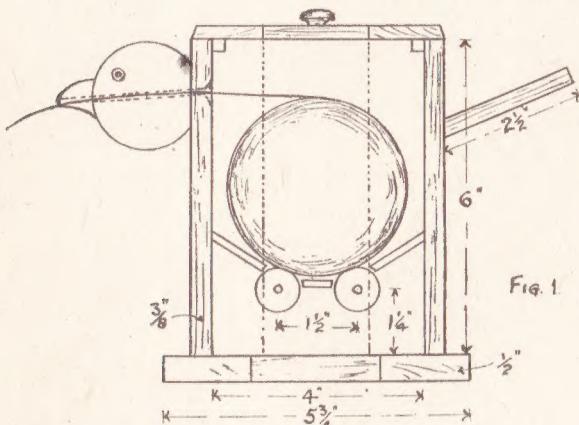


Fig. 1

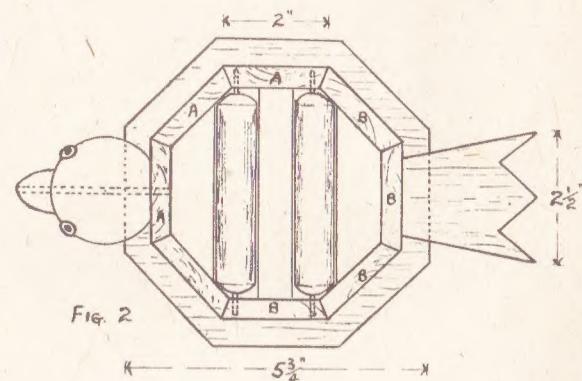


Fig. 2

from the drawing the ball of wool rests on two rollers, thereby making the unwinding process very easy and smooth. It is not necessary to stick to the design as shown: a square case would be equally serviceable and somewhat easier to make, but really nothing like so attractive as the eight-sided one as shown.

If a little trouble is taken to mitre the edges of the eight sides nicely there is no reason why any difficulty should be experienced in making a good fitting case. Almost any kind of hardwood can be used but the writer has a preference for either walnut or mahogany. Both these are splendid woods to work with and will take a good polish.

The Sides

Start by cutting the eight sides for the case 6ins. long, 2ins. wide and $\frac{1}{8}$ in. thick. The best way to get the correct angles for the mitres is to draw out the plan to full size, as shown in Fig. 2. Then you can proceed to mitre the edges. Go slowly, planing off a little at a time until a perfect fit is obtained, laying the work on the plan from time to time to get the mitre lined up correctly.

Before any gluing is done the head and tail should be made and fitted in position. The head is made from a piece of 2ins. diameter wood about 2 1/2ins. long. With a knife and chisel carve it to the

eyes are made by fixing a glass bead on either side with a large headed pin. Now fix the head in position with a little glue and two small wood screws on the inside.

The Tail

In order to give a balanced appearance to the article a tail is fixed on the side opposite to the head. It can, of course, be used to carry the case. A piece of $\frac{1}{8}$ in. wood 2 1/2ins. long and 2 1/2ins. wide is cut similar to the pattern and glued and secured with panel pins, as shown in Fig. 1.

The case can now be glued together in two pieces—all the sides marked (A) in Fig. 2 making one half, and all the pieces marked (B) for the other half. These two halves are fastened together after the rollers have been fitted, which is the next job.

Two pieces of $\frac{1}{8}$ in. dowel rod slightly less than 4ins. long are pivoted 1 1/2ins. up from the bottom of the case. The pivots may be $\frac{1}{8}$ in. dowel rod or thin nails with the heads cut off and filed up smooth. For a neat job the pivot holes should not be drilled right through the sides. The two rollers are placed 1 1/2ins. apart.

False Bottom

Reference to Fig. 1 will show a kind of false bottom which is fixed on either side of the rollers and also between

Heavy Base

A good solid base is now needed to help keep the case steady, but if the hole in the head is nicely smooth and the rollers turn easily, the wool should glide out of the beak without any effort, and not need to be pulled.

The base projects $\frac{1}{8}$ in. beyond the case and is, therefore, cut from a piece of wood 5 1/2ins. square and $\frac{1}{8}$ in. thick. It can be fastened to the sides either by gluing or with countersunk screws from the underside.

Lid Part

A neat fitting lid will complete the woodwork and a thickness of $\frac{1}{8}$ in. is ample for the job. Cut it to exactly fit the top of the case and bevel the edges slightly. In order to keep the lid in position a few strips of $\frac{1}{8}$ in. square wood are glued inside the lid—four would be sufficient but a neater job will be made if they are put all round. Complete the lid by fitting a small knob in the centre.

Glasspaper the whole case and either french polish, or a better finish is obtained with a good wax polish. There are many other ideas that could be adopted instead of the bird's head—for instance, quite a number of animals are suitable for the job, provided they have a nice mouth to open and that they do not tax the carver's skill too much. (350)

The photographer can make this fixed focus DAYLIGHT ENLARGER

EVERY amateur photographer knows the advantages of owning an enlarger, but it is not every photographer who can afford this rather expensive piece of apparatus.

If you do not own an enlarger and would be satisfied with postcard size prints from V.P.K. or similar negatives, try making the daylight enlarger described below. It is quite an inexpensive item to make, the constructional work is easy and needs only the simplest of tools, and, once made, enlargements can be produced as easily as ordinary contact prints.

The Lens

An enlarger is actually a form of camera and (as in the camera) the lens is the most important part of the equipment. An ordinary magnifying glass will serve quite well as an enlarger lens, but for really high-class results a proper camera lens should be used. It is always possible to buy a cheap second-hand box camera, and the lens of this would be ideal for the job.

The length of the enlarger box will depend on the 'focal length' of the lens to be used, and if there is any choice in the matter this focal length should be about 3ins.

Focal Length

Measuring the focal length of a lens is simple enough. In a darkened room stand a candle at one end of a table and a sheet of white paper at the other end. Hold the lens near the paper and adjust its position so a sharp image of the lighted candle is thrown on the paper. Measure the distance between the lens and the paper, and this will give the focal length of the lens. Fig. 4 is a diagrammatic view showing how the light rays pass from an object to the paper via the lens, the focal length of the latter being marked F.L.

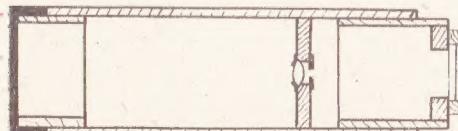


Fig. 1—Sectional view of article



Fig. 2—Section of lens holder

Most lenses of the box camera type have a focal length of about 3ins., and the enlarger described below is for a lens of that particular measurement. For other focal lengths it will be necessary to work out the distance between the lens and the negative and lens and paper in the manner described at the end of the article.

Wood $\frac{3}{8}$ in. thick is used for the enlarger box, the top and bottom being 1ft. 2ins. long by 5 $\frac{1}{2}$ ins. wide, and the sides 3 $\frac{1}{2}$ ins. wide. The sides are glued

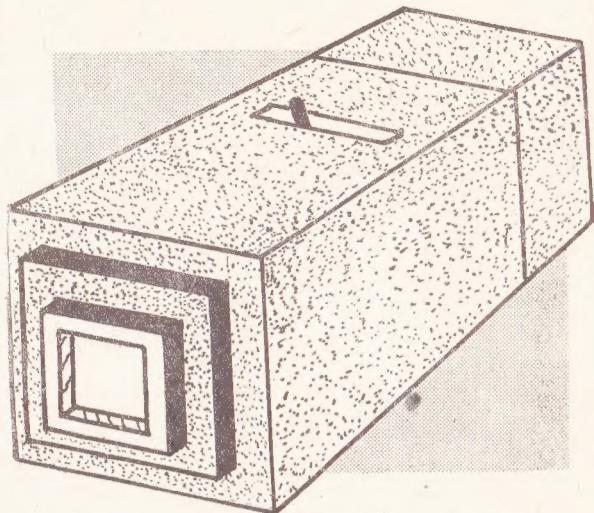
and pinned on to the bottom, but the top is not put on at this stage.

Two wooden 'collars' are made to form a tight fit at each end of the box. At the back of the enlarger the collar is 1 $\frac{1}{2}$ ins. long and is open at back and front (projecting $\frac{1}{2}$ in. beyond the back of the sides) while at the front of the enlarger the collar is 3ins. long. This latter collar is closed in at the front with a wooden panel from which a rectangle of the negative size has been cut, but at this stage the collar is not fixed firmly into place.

Box Framework

These two collars are clearly shown on the sectional side view of the enlarger at Fig. 1, though the drawing (more especially in length) is not true to scale. At the back of the enlarger it will be seen that a lid (shown in solid black) fits over the collar, and this should be the next part to be made. It is of simple box-like construction of $\frac{1}{8}$ in. wood, with a bottom of similar thickness.

The lens must then be mounted in the centre of a piece of $\frac{1}{2}$ in. thick wood measuring 5 $\frac{1}{2}$ ins. long by 3 $\frac{1}{2}$ ins. high. A hole of slightly less than the lens diameter is drilled in the centre of this, and the lens fastened over the hole by four small clips of thin metal. At the other side of this panel a 'diaphragm' is fixed, this being a square of thin metal with a



The lens panel is then fixed into the enlarger box so the lens is at 4 $\frac{1}{2}$ ins. from the main front of the enlarger (see Fig. 1), being held into place by screws through the sides.

Adjustment

It is now necessary to adjust the front collar. A negative should be put between two pieces of glass and held over the front of the enlarger by a couple of elastic bands. The back of the box is removed and a piece of ground glass is laid in its place.

The apparatus is held towards the light (the top being covered with a piece of dark material to exclude light) and the front collar is adjusted until it gives a perfectly sharp image on the ground glass screen. The collar is then permanently fixed in that position, and the long top of the enlarger can also be glued and pinned into place.

All joints must then be made light-tight with plastic wood, and after a thorough glasspapering the enlarger can be painted inside and out with matt black.

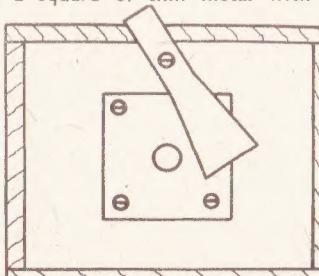


Fig. 3—Shutter action

$\frac{1}{16}$ in. hole in its centre that comes in line with the centre of the lens (see Fig. 2 for a sectional view of this fitting).

A shutter must be fixed over the diaphragm. This is a piece of shaped brass, 3ins. long, held by a screw just sufficiently tight to hold the shutter either open or closed. A sectional view of the diaphragm and shutter (in the open position) is at Fig. 3.

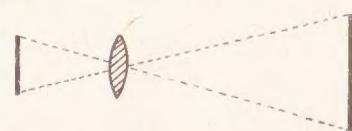
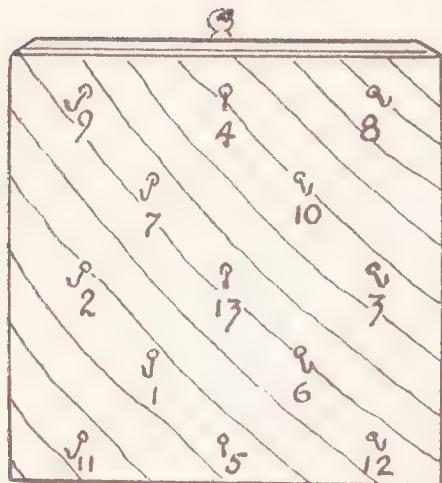


Fig. 4—How the light passes the lens

To use the apparatus, a negative is put between two pieces of glass at the front and a bromide postcard at the other end of the enlarger. The postcard must be inserted in the dark-room. Both back and front are held in place by elastic bands. The enlarger is then taken into the open (negative pointing to the sky), the shutter is opened, the necessary exposure given, the shutter closed, and

(Continued foot of page 315)

A number of interesting ways of making A RING BOARD



THOUGH this game has been rather ousted from public favour by the growing popularity of darts, it can still provide amusement and skill, and is certainly worth including in indoor sport. It is cheap to make, as beyond a few pieces of wood for the board, there is only the cup hooks and, perhaps, the rings, to purchase, a matter of pence. Another point in its favour is its freedom from risk, children can be left to play it in complete safety.

The board is shown in Fig. 1. It can be made from any wood available, battened on the rear to prevent warping. Three-

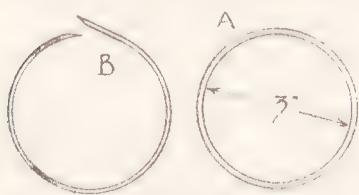


Fig. 2—The rings

ply can also be used for hardboard, but the battens must be so arranged as to come behind the spots where the hooks will be to provide sufficient thickness of material to receive them.

This is shown by the side view of the board. Glue the battens and add a few

small screws, or if the plywood is thin, substitute small nails, driven into the wood behind and afterwards punched down level.

The spots for the hooks can be set out as shown in the drawing, by marking the rectangle, dividing it into four equal parts and then centring each part. At these points make holes for the hooks. Now glasspaper the board, stain it any colour desired, and paint on the numbers as neatly as possible, black or white. When dry, finish the work with a coat of clear varnish.

Hooks and Rings

The hooks are of the cup variety, to be bought at most hardware or oil shops. Drive these in their respective holes securely. At the top screw a metal glass plate for hanging the board on the wall, or a screw eye can be employed here, as long as the board hangs flat and not tilted.

The rings may be bought at a toy or sport shop. They are of rubber, about the best material for such a purpose, being silent in action. If any difficulty is experienced in getting these rings, then it is not a great matter to make a set for oneself. They can be cut from plywood, with an internal diameter as at (A) in Fig. 2, and external one of 3 3/4 ins., not more. These are, however, rather noisy when striking the board, and a good plan to silence them is to wind a thin cord or twine round them.

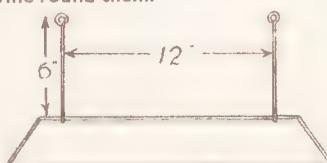


Fig. 3—Netting frame

If you can get a piece of thick rubber, say, about 1/8 in., then good rings can be made by cutting a strip 1 1/2 ins. wide and long enough to make the rings, plus 1/8 in. for the joint. Scarf the joint as at (B) in Fig. 2, and cement together with rubber solution, binding it until the solution is safely set. This can be cut into six slices

to make the set of rings.

Doubtless, ingenious readers may have good ideas of their own to utilise other materials they may have already in their possession. With the rings the game is ready to play.

A Net Accessory

A useful accessory is a net, hung just below the board, into which these rings can drop with safety. It obviates a lot of tiresome back bending, picking up such rings when they drop to the floor, and sometimes roll away. The net is attached to a simple wire frame, something after the shape shown in Fig. 3.

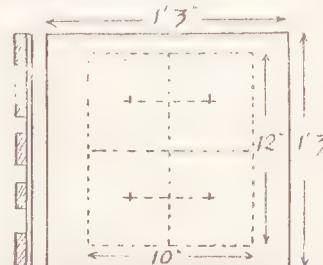


Fig. 1—Side and front view

The frame can be a few inches longer than the board, and about 8ins. wide. The vertical wires shown are soldered to this, and hung from screw hooks, driven in the bottom batten of the board. The net can be stitched up from almost any spare bit of material handy, it does not matter what and is sewn to the frame, hanging downwards to catch the rings.

For Children

If the game is intended for the amusement of children only, quite a good board, and an attractive one, too, can be made from stout cardboard, with battens of wood glued to the back to cover the screw holes. This should be covered with white or coloured paper and the numbers neatly printed on in Indian ink. It can be coloured prettily to please the kiddies, and if clear varnished afterwards, will wear well.

The game is usually played 100 up, and is quite as skilful as darts, and most interesting.

Enlarger—(Continued from page 314)

the enlarger taken back into the dark-room for developing the print.

For a fixed enlarger with a lens of focal length other than 3ins., the distance between negative and lens can be found

by the formula $F \times \frac{L+1}{L}$ and between

lens and bromide paper by the formula

$F \times \frac{L+1}{1}$. In both cases F =the focal

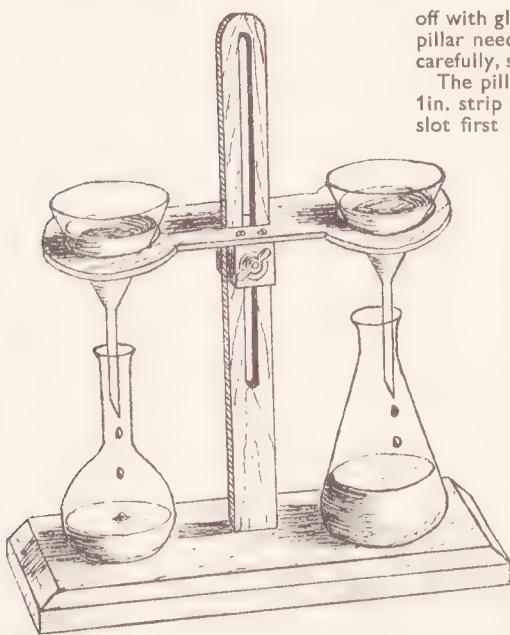
length of the lens, L =the length of the bromide paper, and l =the length of the negative.

Thus, for focal length 4 1/2 ins., negative length 1in. and length of bromide paper 4ins., the distances would be 5 5/8 ins. and 22 1/8 ins. respectively.

Pay careful attention to all constructional details and you will be able to make an enlarger worth several times the cost of materials (236)

**Designs are given free
with every other
issue but not with
back numbers of
Hobbies**

Filter stand, etc. are included in this home-made CHEMISTRY APPARATUS



THE home chemist very naturally wishes to spend his pocket money on increasing the range of his experiments. As, however, the adjuncts to his experiments, the porcelain and glassware and the devices to hold them in position, are expensive, it behoves him to make as much apparatus as possible.

The double filter stand illustrated represents a saving of eight to ten shillings, and as there is nothing difficult in its construction is well worth making. You will probably find the few necessary bits of wood around the house. If these are not quite thick, broad or long enough, it will not matter, as the measurements given can be varied a little.

The base should not, however, be too thin. Thickness is needed to give weight and, therefore, stability. Cut the base 12ins. by 4ins., and chamfer the edges, as in Fig. 1. The chamfer is not necessary, of course, but it gives an authentic air. Alternatively, you can round it roughly with a small fretwork plane and smooth

off with glasspaper. The slot to hold the pillar needs marking and fretsawing out carefully, so as to fit the pillar tightly.

The pillar (Fig. 2) consists of a $\frac{1}{2}$ in. by 1in. strip of wood 14ins. long. Cut the slot first with a fretsaw, using a metal straight edge if you have one. The width of this slot must be a shade wider than the thickness of the bolt used to move the funnel holder up and down. Now saw out the round top end and glasspaper, taking care that you do not thin down the bottom end so that it fits too slackly in the base slot.

Should the latter misfortune happen, you may with care rectify it by gluing a slip of paper on the slack side of the pillar base. Now to fix the pillar in the base. Waterproof cement is, obviously, preferable to glue, for even the most careful experimenter spills aqueous solutions at times. Apply

cement to both slot and pillar base and press in the pillar, making sure the two are flush beneath. Even a slight protrusion of the pillar will produce an unsteady stand.

For the funnel holder (Fig. 3) you need a 10ins. by 4ins. piece of $\frac{1}{8}$ in. thick plywood (or a piece of thin hardwood) and two 1in. squares of $\frac{1}{2}$ in. thick stripwood. First mark off on the plywood a 10ins. by $3\frac{1}{2}$ ins. rectangle, and with compass and pencil, draw a $3\frac{1}{2}$ ins. circle at each end.

Now draw a centre line lengthwise along the wood, and, using this as a guide line, draw parallel lines $\frac{1}{2}$ in. on either side of it, long enough to just intersect the $3\frac{1}{2}$ ins. circles. Having thus

marked out the outline, it only remains to indicate the inner portions which will have to be cut out.

Draw $2\frac{1}{2}$ ins. circles concentric with the $3\frac{1}{2}$ ins. circles, then mark off the 1in. by $\frac{1}{2}$ in. pillar slot in the centre. Use a fine fretsaw to cut out this part of the stand and glasspaper well at the edges.

Drill the 1in. squares with holes wide enough to take the bolt, and screw them on to the plywood as indicated.

Slip the funnel holder on to the pillar and see if it moves up and down easily. If it is tight, carefully file or glasspaper the tight part of the slot until all is well. If the funnel holder is now replaced on the pillar, and the bolt threaded through, the holder may be secured firmly at any height along the slotted pillar by tightening the wing nut. Steel washers should, of course, be inserted behind bolt head and wing nut to protect the wood squares.

The best finish to use is aluminium paint, as this allows a freer movement than ordinary paint, enamel or varnish, being free of their slight stickiness. The silver colour looks very clean and scientific, too.

With the growing substitution of electricity for gas in our homes, more and more home chemists are being forced back to the spirit lamp. It is useful to have several of these handy and, as small ones cost about half-a-crown, expense can be avoided by making them oneself. They are easily constructed from suitable sized ink or other bottles, as shown in Fig. 4.

The wick tube can be of metal or glass, $\frac{1}{2}$ in. to $\frac{1}{4}$ in. wide. Cut a $1\frac{1}{2}$ ins. length and pass it through a bored cork.

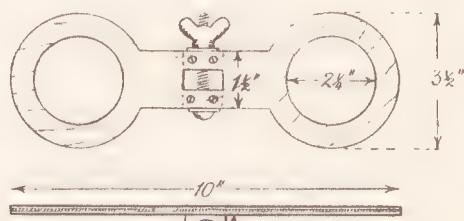


Fig. 3—The platform and wing nut

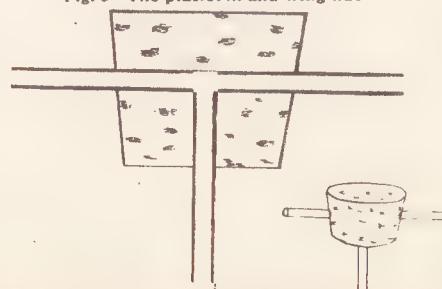


Fig. 6 A useful T tube

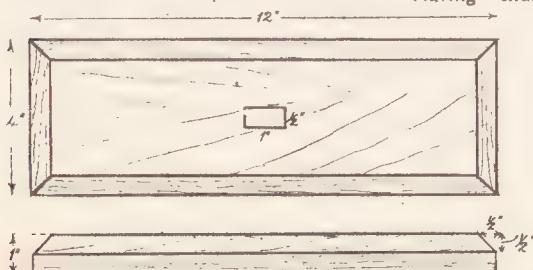


Fig. 1—The base

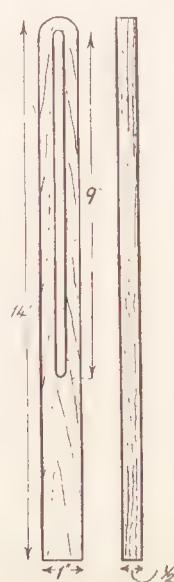


Fig. 2—The pillar

Cut a small nick in the cork from top to bottom; this is essential, for it admits air to replace the burned spirit. Without it the spirit will not rise readily.

For the wick either unrove strands from a clean oil lamp wick or strands from a piece of old cotton blanket. Use enough strands to make a not too tight fit. Leave about half the cork protruding from the bottle neck. Over this for a cover press a glass specimen tube of suitable bore.

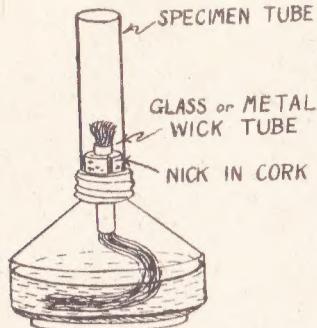


Fig. 4—Ink bottle spirit lamp

For a wash bottle choose a wide mouthed pickle or salad cream bottle, and a soft cork to fit it (you can soften it further by squeezing or rolling it underfoot).

For the exit tube take a length of glass tubing $2\frac{1}{2}$ ins. longer than the height of the corked bottle. Make a 45 degrees bend $1\frac{1}{2}$ ins. from one end by softening the tube at this point, by revolving it in a spirit or a gas flame. Let the tube bend by its own weight. Forcing results in

unsightly kinks. Bends should always be made in this manner.

The length of the mouth tube is

A

3½ ins. plus the length of the cork. Bend this 2½ ins. from one end to an obtuse angle of 135 degrees. The other end is pushed into the cork until it is level with the bottom. In Fig. 5 the mouth tube is shown deliberately long to indicate its function.

Fig. 5—A wash bottle

shown, and cut at (A) with a file. Join this to the exit tube with a piece of rubber tubing. This flexible jet is an improvement on the fixed type, for you can direct the stream of water to any point with the forefinger and so avoid twisting your neck about. All the open ends of the tubes should, of course, have their sharp edges removed by heating them until the glass just begins to soften.

A Woulff's or gas washing bottle can also be made from a wide mouthed bottle in a similar way, bending the glass

tubes at right angles and dispensing, of course, with the jet. Such a bottle will also serve as a gas generating bottle, if you remove one tube and put in a thistle funnel instead.

For a blowpipe take a length of glass tubing and draw out a fine jet at one end. Sever it carefully in the centre of the drawn out part, then make a right angle bend $1\frac{1}{2}$ ins. from the jet. A convenient length for the shaft is 8ins. Round off the sharp edges at the mouthpiece by heating.

Dropping pipettes can be made in a similar manner, but dispensing with the bend. These are more efficient if a bulb is blown in the middle. To blow a bulb heat the centre of the tube until it softens, close one end with your finger and blow gently down the other until the diameter of the bulb is about four times that of the tube.

For a sandbath any large tin lid or dish may be used, and a substitute for wire gauze is a sheet of tin. A test tube holder is quickly made from a strip of stout paper folded several times lengthwise. Double it round the test tube and slide thumb and forefinger along the ends towards the tube until the paper is tight. Alternatively, a retort stand clamp may be used.

For a T-tube, a sound cork and three lengths of glass tubing are needed, as shown in Fig. 6. Bore one hole right through and a second at right angles to meet the first. Such a tube is useful for fixing up two bunsens when you have only one gas point, screw clips being used on the rubber tubing between each bunsen and the T-tube, so as to control or stop the supply to each burner.

Prepare for the summer camping with a SIMPLE HAY BOX

AHAY box is easily and cheaply constructed, and is an excellent fuel saver during the winter months, whilst during the summer, when the absence of a fire may be welcome, it can prove a great help in cooking meals. For campers, too, it is a boon.

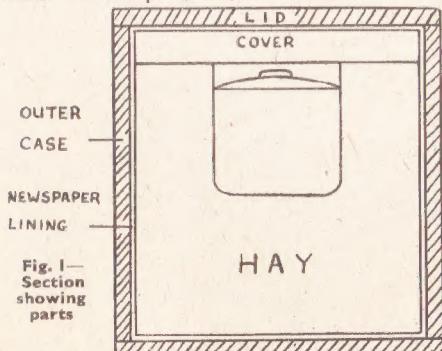
practically the same temperature for many hours.

Thus, porridge brought to the boil and placed in the hay box at night will continue to cook, and be hot and ready to eat next morning. The heat insulation is provided by the air spaces between the many thousands of pieces of hay in the box.

Fig. 1 shows a section through the hay box. To construct, you will need a fairly large wooden box with a lid. A packing case or an old trunk will suffice, provided that it is big enough to take the cooking utensils you intend to place inside, with plenty of room to spare. The lid should be hinged, and have a catch to secure it when closed.

Heat Proof

The next step is to make the wood more heat-proof, so get as many newspapers as you can, and tack them along the bottom, sides and lid, so as to form a thick layer, the thicker the better. Newspaper is an excellent insulator, and this layer serves both to keep draughts from entering the



The principle of the hay box is simple: the hay inside the box has great heat-retaining powers, so that a saucepan of hot food placed inside will retain

cracks in the wood, and to keep the heat inside the box.

Next get some clean dry hay and pack it tightly inside the box, leaving an opening in the centre where the saucepans, etc., will be placed. As a cover for the top of the box just underneath the lid, fill an old pillow case with hay, or make a bag from an old garment.

This can be tacked to the lid of the box, or left loose, as desired. If you have any difficulty in getting hay, you can make some by collecting grass and drying it in the oven or in a shed.

When using the box, place the hot container inside, press the hay close round it, fix the cover over the top, and secure the lid. Do not open the box again until the food is required for use.

Used by campers the hay box overcomes the difficulty of cooking several courses on one stove or fire. Part of the meal may be cooked, and stored in the box while the rest of the cooking is being done. Meals for late comers can be kept warm for hours without difficulty. This is useful in the home, too, where members of the family come home at different times.

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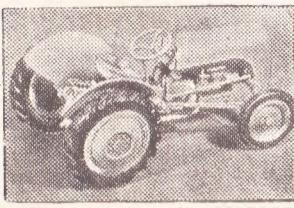
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